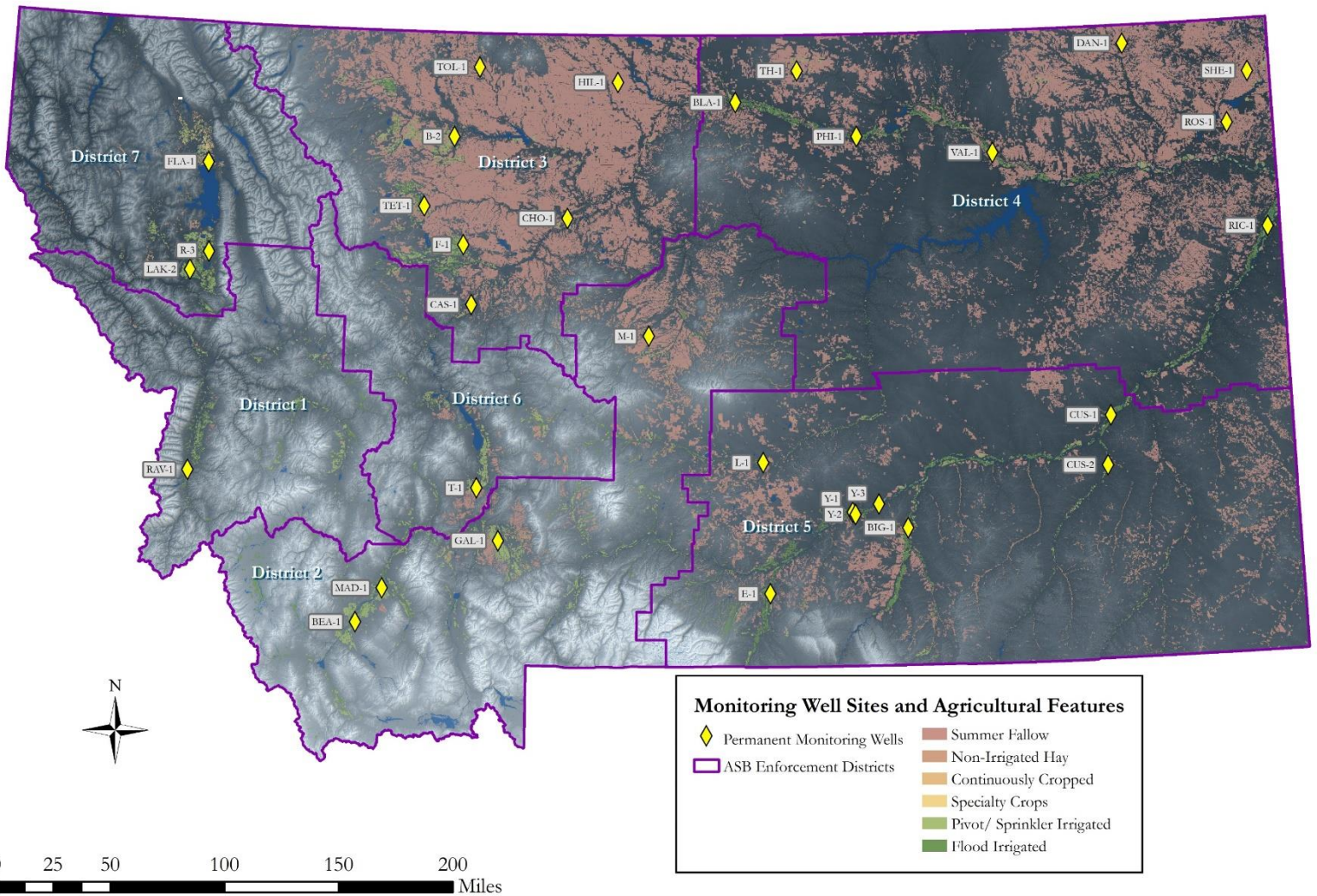


# Groundwater Protection Program



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## Montana Department of Agriculture Groundwater Protection Program, 2019 Monitoring Locations



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During the 2019 sampling season, the Groundwater Protection Program (GWPP) collected water samples from 27 permanent groundwater monitoring wells and 5 Montana Salinity Control Association groundwater monitoring wells. All wells were sampled in May, June and September. In total, 127 samples were collected and analyzed for up to 108 pesticides and pesticide metabolites. Results are summarized in the following tables by region. No detections exceeded the respective drinking water standard, or the action threshold of 50% of the respective drinking water standard. In general, most samples were < 6 % of the respective drinking water standard.

## District 1

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
2,4-D	1	0.020	70 (sum parent + metabolite)
Imazapic	2	0.004	3000

## District 2

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
Clothianidin	1	0.017	650
Flucarbazone	2	0.006	3000 (sum parent + metabolite)
Imazamethabenz	3	0.011	1700 (sum parent + metabolite)
Prometon	4	0.007	100

## District 3

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
2,4-D	1	0.009	70 (sum parent + metabolite)
Clopyralid	1	0.430	1000
Imazamethabenz	5	0.254	1700 (sum parent + metabolite)
Imidacloprid	2	0.011	380
Isoxaben	1	0.004	N/A
Pinoxaden	2	0.003	2000 (sum parent + metabolite)
Prometon	1	0.001	100
Pyrasulfotole	2	0.005	70
Pyroxsulam	1	0.068	7000

## District 4

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
2,4-D	1	0.020	70 (sum parent + metabolite)
Imazapic	2	0.004	3000

## District 5

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
2,4-D	1	0.015	70 (sum parent + metabolite)
Alachlor	6	0.060	2 (sum parent + metabolite)
Atrazine	3	0.011	3 (sum parent + metabolite)
Bentazon	4	0.021	210
Clothianidin	7	0.139	650
Flucarbazone	1	0.009	3000 (sum parent + metabolite)
Imazamethabenz	1	0.001	1700 (sum parent + metabolite)
Imazethapyr	3	0.059	17000
Metolachlor	14	0.041	1000 (sum parent + metabolite)
Pinoxaden	6	0.009	2000 (sum parent + metabolite)
Prometon	1	0.009	100
Pyrasulfotole	3	0.009	70
Simazine	3	0.005	4
Thiamethoxam	2	0.005	80

## District 6

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
Atrazine	3	0.013	3 (sum parent + metabolite)
Imazamethabenz	2	0.009	1700 (sum parent + metabolite)
Imazamox	1	0.011	20000

## District 7

Analyte	Number of Detections	Average Detected Concentration (ppb)	Drinking Water Standard (ppb)
2,4-D	1	0.013	70 (sum parent + metabolite)
Aminopyralid	2	0.163	3000
Bentazon	1	0.003	210
Imazamethabenz	2	0.058	1700 (sum parent + metabolite)
Imazapic	1	0.004	3000
Metolachlor	4	0.792	1000 (sum parent + metabolite)

# Analyte Glossary

## **2,4-D:**

2,4-D is a selective systemic herbicide with a wide variety of uses, which include ornamental lawns and turf, right-of-ways, range and pasture, forest management areas, and several crops including corn and small grains. It is highly soluble in water, non-volatile and has a low potential to leach to groundwater based on its chemical properties. It is non-persistent in soil but may persist in aquatic systems under certain conditions.

## **Alachlor:**

Alachlor ESA (ethane sulfonic acid) is a metabolite (break-down product) of alachlor, a selective systemic herbicide absorbed by germinating plant shoots. Alachlor is labeled for crop use in beans, corn, and sorghum. It can be applied via soil or water treatment, or aerial application. Alachlor tends to break down easily in the environment, and is somewhat mobile; however Alachlor ESA is stable and easily leached through soils.

## **Aminopyralid:**

Aminopyralid is applied to wheat, hay, and pastures to control broadleaf noxious weeds. It is a persistent herbicide and does not break down readily in the environment, and can stay active even in manure, mulch, or compost. It is non-volatile, highly soluble in water and, based on its chemical properties, is mobile and has a high potential for leaching to groundwater. It may be moderately persistent in soil systems but would not be expected to persist in surface water under normal conditions.

## **Atrazine:**

Atrazine is a restricted use selective systemic herbicide, and yields several degradates (break-down products) including deethyl atrazine and hydroxy atrazine. Atrazine can be used on sorghum and corn in foliar and soil applications. It can also be used in some ornamental turf applications and has previously been labeled for use on roadsides. Atrazine and its degradates tend to be persistent in the environment and have moderate to high leachability in soils.

## **Bentazon:**

Bentazon is a contact herbicide that is used for post-emergence control of annual weeds in several crops and can also be used in non-crop areas. Crop sites include beans, peas, sorghum, and corn, and non-crop sites include ornamentals and turf, rights-of-way, and roadsides. Bentazon is stable in water, but tends to break down in soils. It is highly soluble in water and moderately mobile in soils.

## **Clopyralid:**

Clopyralid is a pyridine compound and functions as a selective systemic herbicide that is absorbed through plant leaves and roots. It is labeled for non-crop uses, including fallow land, roadsides, rights-of-way, pasture, rangeland, and CRP lands. Clopyralid is a persistent herbicide that may remain active in animal manure or compost and does not break down readily in the environment. It has a high solubility and is highly leachable to groundwater. It can be persistent in both soil and water systems depending upon conditions.

## **Clothianidin:**

Clothianidin is a neonicotinoid insecticide used to control sucking and chewing pests in corn and seed crops typically as a seed treatment, spray, dust, or soil drench. It has a moderate solubility and can accumulate in both soil and water.

## **Flucarbazone:**

Flucarbazone is an herbicide that is absorbed through roots and foliage and can be translocated in plants. Flucarbazone will degrade (breakdown) into flucarbazone sulfonamide. Flucarbazone is labeled predominantly for use in wheat, but can also be used in ornamental turf and some specific grasses. It is highly soluble and very leachable in soils. It is not persistent in soil, but it can be very persistent in water.

## **Imazamethabenz:**

Imazamethabenz methyl acid metabolite is a metabolite of the selective, systemic herbicide imazamethabenz methyl ester. This herbicide is labeled only for crop use in wheat, barley, and sunflowers. It is highly soluble in water, leachable in soil, and tends to be persistent in both soil and water.

**Imazamox:**

Imazamox is a post-emergence herbicide used to control broadleaved plants. It is a contact herbicide with residual activity. Imazamox is labeled for use in some crops including small grains, lentils, sunflowers, canola, and alfalfa, and for non-crop applications including rights-of-way, industrial areas, and some aquatic environments. It is highly soluble and leachable and tends to be persistent in most soil and water environments.

**Imazapic:**

Imazapic is a selective and systemic herbicide with both contact and residual activity. It is generally used to target annual and perennial grasses and some broadleaf weeds. Imazapic is labeled for use in limited agricultural sites and several non-crop areas such as range and pasture, petroleum tank farms, fence rows, ornamental planting areas, right-of-way, and roadsides. Imazapic is highly water soluble, leachable in soils, but not likely to remain stable in soils.

**Imazethapyr:**

Imazethapyr is a systemic herbicide with contact and residual activity. It is registered for use in many crop applications, including beans, peas, alfalfa, lentils, corn, and some grasses. It can be applied soil or foliar treatment at several sites. Imazethapyr is persistent in the environment, highly leachable in soils, and may be subject to particle-bound transport.

**Imidacloprid:**

Imidacloprid is a synthetic, neonicotinoid insecticide. It is labeled for use with foliar and soil applications and seed treatments in several crops, ornamental plants, turf, trees, and greenhouses. Imidacloprid is very soluble and leachable, and tends to be stable and relatively persistent in most soil and water environments.

**Isoxaben:**

Isoxaben is a selective preemergent herbicide used primarily to control specific broadleaf weeds and grasses in non-cropland areas, established turf, field- and container-grown ornamentals, groundcovers, nursery stock, ornamental bulbs, Christmas tree plantations, and non-bearing fruit trees. Isoxaben is persistent in water and on soil surfaces. Because of its solubility, Isoxaben is expected to runoff to a moderate extent.

**Metolachlor:**

Metolachlor ESA (ethane sulfonic acid) and OA (oxanilic acid) are degradates of metolachlor, a selective herbicide that inhibits seed germination and mitosis. Metolachlor can be used on ornamental turf and some containerized plants, but is most commonly used in crops such as corn, sorghum, and some beans and peas. Metolachlor ESA tends to be very leachable in soil and more persistent than its parent compound.

**Pinoxaden:**

Pinoxaden is a postemergence herbicide for the control of several grass weed species in all varieties of spring wheat (excluding durum), winter wheat, and barley. The fate and disposition of pinoxaden in the environment suggest a compound that is an herbicide that is persistent and mobile, stable to hydrolysis, and has the potential to reach aquatic environments and organisms via sheet and channel run-off, discharged groundwater into surface waters, and spray drift from either ground or aerial spray application.

**Prometon:**

Prometon is a herbicide used on non-crop land such as industrial sites, railroad right-of-ways, around farm buildings, or other places where long term weed control is desired. Prometon is not persistent in soils but highly persistent in water. It is also highly soluble and highly leachable.

**Pyrasulfotole:**

Pyrasulfotole is a selective herbicide also known as methanone (5-hydroxy-1,3-dimethyl-1*H*-pyrazol-4-yl)[2-(methylsulfonyl)-4-(trifluoromethyl)phenyl]. Pyrasulfotole is registered for use on cereal grains, and is most commonly used in wheat and barley. Pyrasulfotole is more persistent in water than in soil, highly leachable in soils and very mobile in surface water runoff.

**Pyroxsulam:**

Pyroxsulam used on wheat, as well as lawns and ornamental areas. It has value as a soil treatment in yards and roadways and prevents the growth of broadleaf weeds. It has low residual effect but some potential for building up in populations of prey species, such as insects.

**Simazine:**

Simazine is a soil-acting herbicide used with corn and in non-crop areas to control broad-leaved weeds and annual grasses. It has a low solubility but once dissolved into water simazine is stable. Simazine can accumulate in soil over time if applied repeatedly.

**Thiamethoxam:**

Thiamethoxam is an insecticide used to control a wide range of pests including aphids, whiteflies, thrips, mealybugs, wireworms and ground beetles. It is persistent in both soil and water, and highly soluble and leachable.